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(54) Abstract Title
Rotary valve constructions

(57) A rotary valve comprises a valve body 10 enclosing a valve chamber 17 with a generally cylindrical rotatable valve member 18 comprising compartments 25 divided by preferably helical vanes (24, figure 2). The housing is composed of side members 11, 12, end plates (13, 14) and apertured plates 15, 16 defining inlet and outlet ports.

The parts 11, 12; 15, 16 and (13, 14) may each be removed separately and replaced with an identical part to effect repair by replacement, without complete disassembly or scrapping of the valve.

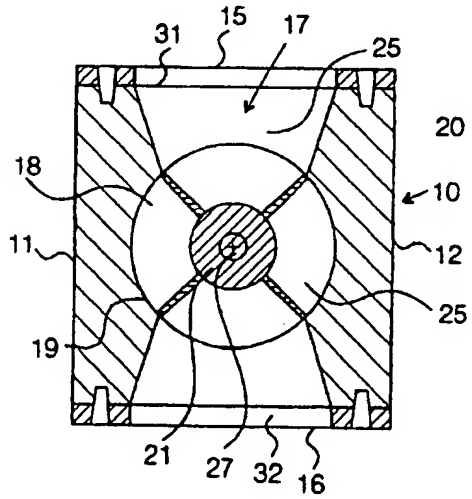

Fig. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.
The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1995
This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

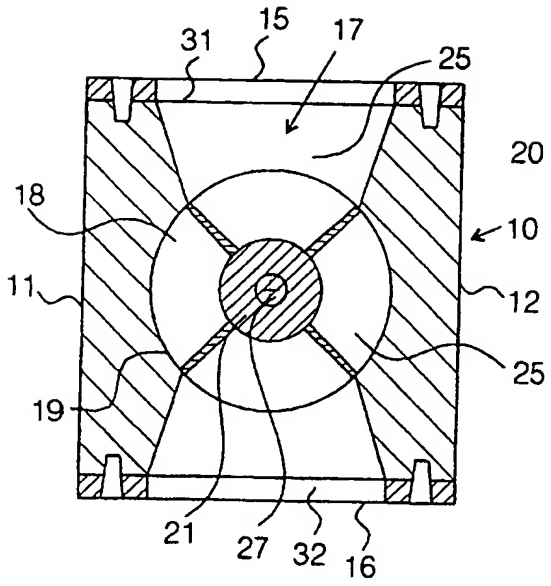

Fig. 1

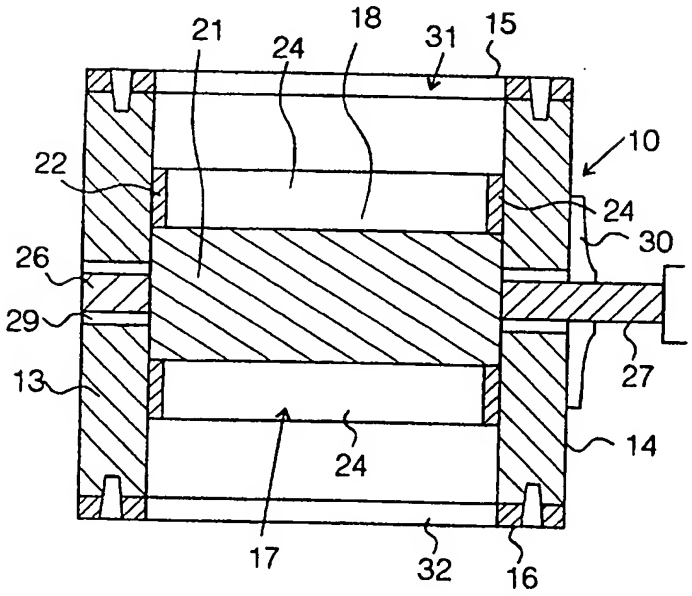

Fig. 2

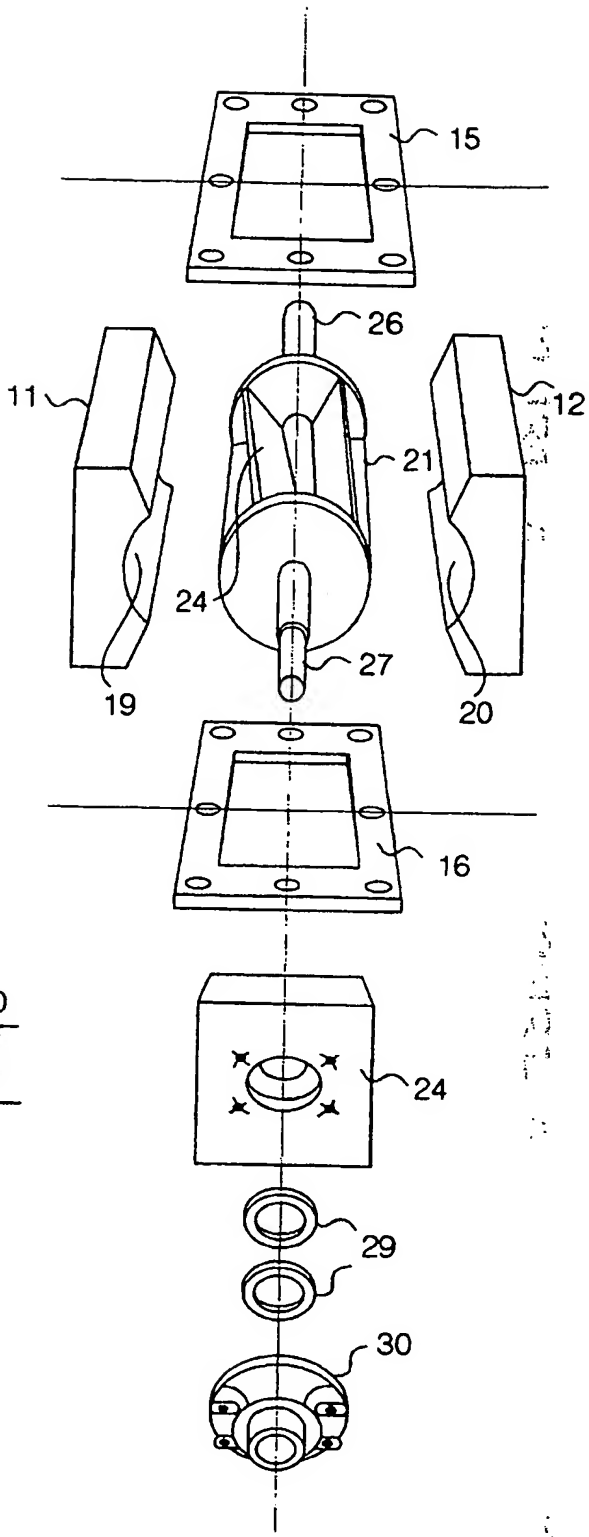

Fig. 3

ROTARY VALVE CONSTRUCTIONS

This invention relates to rotary valve constructions.

A rotary valve usually comprises a valve body of cast metal, especially cast iron, having a cavity or passage in the valve body for a rotatable valve member. The axis of rotation of the valve member is usually at right angles to the direction flow of material through the valve. An axis of rotation at right angles to the direction of material flow is usually adopted for rotary gate valves, or 'dosing' valves, where a steady flow rate of a fluent particulate or powdered material, such as dry foodstuffs, grain or the like, is to be maintained from a bulk source such as a hopper. In such a valve, the valve member comprises a rotor which has a series of separate compartments, separated for example by vanes, or provided as pockets in the rotor surface. The rotor construction is such that the compartments are mutually sealed, and from the inlet and outlet, thus providing a sealed airlock which enables material to be transferred into a vacuum or pressurised conduit, without air leakage. This can be of use in feeding powders into pneumatic delivery systems for example.

In such valves the valve body is fabricated or a single piece casting, provided with ports for inlet and outlet of material and apertures for fitting of the rotary valve member, its bearings and operating shaft lining. Such a valve body is vulnerable to breakage, particularly as cast iron is notably brittle, and difficult or impossible to repair. The interior may be provided with an internal lining. Thus if one part of a valve body casting is broken, such as an inlet port or mounting flange, then the whole

valve is compromised and must be replaced. In many cases, in addition to the cost of the valve itself, the operation of removing a defective valve and replacing it with a new valve can be difficult and time consuming.

An object of this invention is to provide a rotary valve construction whereby such disadvantages are mitigated, notably so that damage to one part of a valve construction need not lead to rejection of the whole valve.

According to the invention a rotary valve comprises a valve body enclosing a valve chamber in which a rotary valve member is mounted so as to be rotatable, the valve body providing inlet and outlet ports for the valve chamber, characterised in that the valve body is built up from a plurality of separate sections which can be removed and replaced from the valve body.

Preferably, the valve body comprises a pair of matching body side members. In addition the separate sections may also include a pair of port flanges, and a pair of end plates. The end plates preferably are provided with bearings and seals for trunnions or a drive shaft for the valve member.

In one embodiment, the valve member is arranged with its axis of rotation transverse to the path of material through the valve. The valve member is generally cylindrical with compartments separated by helical or straight partitions, and may be driven at a constant rate to provide a predetermined flow of material from a bulk source such as a hopper through an airlock provided by the valve. Helical vanes provide for a shearing

action in closing the compartment. The deviation of the vane from straight may be minimal, and shearing action may be alternatively be provided by shaping the edge of the inlet part. The deviation involved may again be minimal.

The body side members may be configured to provided part - cylindrical curved surfaces to at least partially define a valve chamber for housing the valve member, and the body side members may further be provided with upper and lower edge chambers to at least partially define inlet and outlet ports.

A preferred embodiment of rotary valve construction according to the invention will now be described, by way of example with reference to the accompanying drawings, wherein:-

Fig 1 is a sectional view of a preferred embodiment of rotary valve construction according to the invention; and

Fig 2 is further sectional view, along the axis of the valve of Fig 1, and

Fig 3 is an exploded view of the valve of Figs 1 and 2. The rotary valve construction according to the invention illustrated in the drawings is a rotary vane type valve for ensuring a steady, closed, delivery from a bulk source such as a gravity-feed hopper, and is particularly suitable for dry goods such as grain, etc.

The valve has a valve body 10 which comprises two side pieces 11, 12, two end plates 13, 14, and upper and lower flanges 15 and 16. A generally cylindrical valve member 17 is housed within a valve chamber 18. which is at least partially defined by symmetrical part-cylindrical curved surfaces 19, 20 formed in the side pieces 11, 12. Valve member 17 has a generally cylindrical core 21, with end walls 22, 23, and helical or straight vanes 24, dividing the volume into pockets 25. The valve member 17 is supported in the end plates 13, 14 by an end-trunnion 26 and a drive shaft 27. which may be arranged to be driven by a motor 28, (shown schematically). Seals 29 and bearings 30 are better shown in the exploded view of Fig 3.

The ends of the inside faces of side pieces 11, 12 are each provided with a chamber, such that when assembled, as shown in Fig 1, a tapering inlet port 31 is formed at the top, and a corresponding tapering outlet part 32 is formed at the bottom.

The valve body is built up by assembling the side pieces 11, 12, end-plates 13, 14 and flanges 15, 16, about the valve member 17 instead of being provided, as at present, in the form of a single piece casting. The components can thus be individually replaced as required, and can also be made from less brittle materials such as wrought metal, or steel, or in appropriate cases for some uses from synthetic materials. The curved surfaces 19, 20 may be coated or lined with synthetic self-lubricating material, as may the end plates 13, 14 and the contacting parts of the valve member 17.

Because the body is assembled from the components listed above, damage to or breakage of any one part eg to a surface 19, or 20 by a foreign body need not lead to

the scrapping of the entire valve; instead the affected part may be replaced, or if the valve is removed and replaced, the valve can be restored to useable condition by replacement of the defective part and then reused. Because materials which are more robust than cast metal, particularly cast iron. can be used, damage arising due to cracks or fractures is less likely to occur.

Both these factors give rise to economic advantages arising from the valve construction according to the invention which are of great potential importance in the maintenance and refurbishment or replacement of the valve, including not only direct cost factors, but the potential for materials savings arising from the repairability, and capacity for reuse of components and reduction of down time due to replacement of parts rather than the entire valve.

In the case of the valve shown in Figs 1-3, it is possible for the length of the valve in the axial direction of the valve member 17, to be as long as desired, eg to extend across the full effective width of a conveyor to deposit a constant metered flow of material into the conveyor from a hopper. The number of compartments, and correspondingly of vanes may be varied as required. The vanes may provide for mutually sealing of the compartments and thus also the valve may enable material, whether powder or particles in any size range to be fed eg from an un-pressurised hopper to a pressurised or vacuum conveyor conduit, for example whilst avoiding pressure leakage.

CLAIMS

1. A rotary valve comprising a valve body enclosing a valve chamber, a rotary valve member mounted in said chamber so as to be rotatable, inlet and outlet ports for access to the valve chamber being provided through the valve body, characterised in that the valve body is made up of a plurality of sections which can be separately removed from and replaced in the valve body.

2. A valve according to claim 1 wherein the valve body comprises a pair of body side members, a pair of port-defining flanges defining inlet and/or outlet ports in the body and a pair of end plates.

3. A valve according to claim 2 wherein the end plates are provided with bearings and seals for trunnions of the valve member and/or a drive shaft for the valve member.

4. A valve according to any preceding claim wherein the valve member is arranged with its axis of rotation transverse to the path of material through the valve, and is generally cylindrical with compartments separated by helical or straight partitions.

5. A valve according to claim 4 wherein the valve member is arranged to be driven at a constant rate to provide a predetermined flow of material from a bulk source.

6. A valve according to claim 4 wherein said partitions comprise helical vanes.

7. A valve according to claim 4 wherein the partitions comprise axially extending straight vanes, and the edge of the inlet port is disposed along a helical path.

8. A valve according to claim 2 wherein the body side members are configured to provide part-cylindrical curved surfaces to at least partially define the valve chamber, and

are provided with upper and lower edge chamfers to at least partially define the inlet and outlet ports.

9. A rotary valve substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.